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ABSTRACT

This paper reports the outcomes of a correlational study that examined the relationships between visual and auditory perceptual skills, on the one hand, and comprehension that is independent of decoding, on the other. Five sets of test scores--a visual perceptual test (Coloured Progressive Matrices), an auditory perceptual test (Auditory Motor Placement), a listening and reading comprehension test (Durrell Listening-Reading Series), and a single word decoding test (Word Recognition subtest; Diagnostic Reading Scales)--were compared. The resulting correlation coefficients showed a highly significant relationship between visual perceptual skills and listening comprehension, and visual perceptual skills and reading comprehension when the effect of decoding skills was controlled. Auditory perceptual skills were more closely related to reading comprehension than to listening comprehension. It is suggested that although decoding skills explain much of the variance in reading comprehension, visual perceptual skills also contribute to the explanation of this variance. (Author)

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RELATIONSHIPS BETWEEN VISUAL AND AUDITORY PERCEPTUAL SKILLS AND COMPREHENSION INDEPENDENT OF DECODING

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Abstract

This paper reports the outcomes of a correlational study that examined the relationships between visual and auditory perceptual skills, on the one hand, and comprehension that is independent of decoding, on the other. Five sets of test scores--a visual perceptual test (Coloured Progressive Matrices), an auditory perceptual test (Auditory Motor Placement), a listening and reading comprehension test (Durrell Listening-Reading Series), and a single word decoding test (Word Recognition subtest; Diagnostic Reading Scales)--were compared. The resulting correlation coefficients showed a highly significant relationship between visual perceptual skills and listening comprehension, and visual perceptual skills and reading comprehension when the effect of decoding skills was controlled. Auditory perceptual skills were more closely related to reading comprehension than to listening comprehension. It is suggested that although decoding skills explain much of the variance in reading comprehension, visual perceptual skills also contribute to the explanation of this variance.

RELATIONSHIPS BETWEEN VISUAL AND AUDITORY PERCEPTUAL SKILLS AND COMPREHENSION INDEPENDENT OF DECODING

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Reading comprehension, the extraction of meaning from text, appears to be the outcome of certain underlying and interrelated component processes. The comprehending reader must be able to decode--transform visual symbols into language--and must have adequate vocabulary--understand the meanings of most of the individual words.

For some time, research in reading concentrated on the decoding component. In fact, in some quarters, reading comprehension was thought to be exclusively a function of decoding skills (Fries, 1962). This thesis is not supportable. Teachers have long been puzzled by students who can decode fluently and understand individual word meanings, but who cannot comprehend the text. Apparently, something independent of these two component processes is involved.

In considering this phenomenon, Wiener and Cromer (1967) and Cromer (1970) identified two types of poor comprehenders: "deficit poor" and "difference poor." The former are defined by a lack of prerequisite decoding and vocabulary skills, the latter by something else--an apparent inability to organize semantic and syntactic information in a meaningful way. This paper explores further the Wiener-Cromer construct and attempts to link the two types of poor comprehenders with certain specific basic processes--perceptual skills.

There is ample evidence to argue that certain perceptual skills are related to the reading process. A strong relationship has been shown between auditory perceptual skills and primary grade reading achievement (Rosner, 1972). This is not surprising since most primary grade reading programs concentrate heavily on teaching decoding skills (Chall, 1967), and the relationship between auditory perceptual skills and decoding is well documented. Different perceptual skills appear to be more closely related to reading comprehension independent of decoding. Rosner (1975) suggests that visual perceptual skills are closely related to reading comprehension. He speculates that the ability to recognize relationships among the elements of a spatial array is correlated with the ability required to analyze and organize textual information. A correlational study lends support to this speculation (Slaughter, 1974).

The general purpose of this study is to investigate further the relationships between certain perceptual skills and reading comprehension that are independent of decoding. Specifically, two major questions are explored: How well do visual perceptual skills and auditory perceptual skills predict reading comprehension independent of decoding? A related question is also considered: How are decoding skills related to reading comprehension?

Standard measures of reading comprehension require decoding, that is, one must read passages and answer questions. Thus, if the students have poor decoding skills, the resulting test scores will probably reflect this inadequacy and preclude any measurement of reading comprehension.

In order to obtain a purer measure of reading comprehension, it is necessary to separate it from the effects of decoding. This can be done by comparing measures of reading comprehension to measures of listening comprehension. Research indicates that comprehending a written message involves many of the same processes as comprehending a spoken one (Carroll, 1964; Hackett, 1968; Ruddell, 1966; Goodman, Note 1). Therefore, assuming no decoding difficulties, test results for reading and listening

comprehension, on the average, should be the same. If decoding is the principal source of a comprehension problem, it should be reflected only in measures of reading comprehension, not listening comprehension. This study is based on that assumption.

Assuming the above, the following relationships will be investigated: (a) the relationships between visual perceptual skills and listening and reading comprehension, (b) the relationships between auditory perceptual skills and listening and reading comprehension, and (c) the relationships between decoding skills and listening and reading comprehension.

Method

Subjects. The subjects in this study were enrolled in a non-graded school for children with learning disabilities (Pace School, Pittsburgh, Pennsylvania). Based on existing data from the California Achievement Test, 33 students were identified with reading grade equivalent scores between 1.0 and 3.5. This range of reading scores corresponds to that for which the listening-reading test, described below, is designed. The school's Director eliminated 8 students who were thought to be too distractible for reliable testing, and the remaining 25 students were included in this study. These children ranged in age from 9 to 13, with a mean age of 10.8 (SD = 1.5).

Tests and procedures. Two perceptual tests--one visual, one auditory--were used to measure the predictor variables, and a combined listening-reading comprehension test was used to measure the criterion variables. A word recognition test was used to measure the moderator variable.[1]

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[1] The term moderator variable is used here to describe a secondary predictor variable selected for study to determine if it affects the relationship between the primary predictor variables and the criterion variables (Tuckman, 1972).

Visual perceptual skills were measured by the Coloured Progressive Matrices (CPM) test. It is described by its author as a perceptual test of "observation and clear thinking" (Raven, 1965, p. 3).[2] The test consists of 36 incomplete geometric patterns that range from simple to complex. In each item, the student selects from six figures the one which correctly completes the design. A maximum score of 36 is possible. The test was group-administered and required approximately 20 minutes.

Auditory perceptual skills were measured by the Auditory Motor Placement (AMP) tests of the Perceptual Skills Curriculum (Rosner, 1973). The auditory program of the Curriculum consists of 33 objectives, organized into 8 levels. The levels of the program are based on the size of the phonological unit of analysis (word, syllable, or single phoneme) and the complexity of the unit in which the sound is embedded. For example, at a mid-level, the child is asked to: "Say meat; now say it again, but don't say /t/" (Rosner, 1974). A maximum score of 33 is possible. The test was administered individually and required approximately 5 to 10 minutes for each child.

Listening and reading comprehension were measured by the Durrell Listening-Reading Series, Primary Level (Durrell & Hayes, 1970). These parallel listening and reading tests each contain a vocabulary and sentence comprehension subtest. Within each subtest, the student classifies words or sentences under one of three categories. Comprehension is assumed

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[2]The Coloured Progressive Matrices are frequently and inaccurately referred to as a test of general intelligence. Raven (1965) cautions against such misuse in the following statement: "By itself, it is not a test of 'general intelligence,' and it is always a mistake to describe it as such" (p. 3).

if the student correctly categorizes the words and sentences. A maximum score of 96 is possible for each vocabulary subtest; 40 for each sentence comprehension subtest. Thus, a total score of 136 is possible in each of the listening and reading comprehension tests. The test was group-administered and required approximately 30 minutes for each of the four subtests.

Decoding skills were measured by the Word Recognition subtest of the Diagnostic Reading Scales (Spache, 1963). Although the test consists of three graded word lists, only the first two were administered. The third list was eliminated because it was too difficult for the students to read. A maximum score of 90 (50 on List 1, 40 on List 2) is possible. The test was administered individually and required an average of 1.5 minutes per child.

Testing was conducted in September and early October. The CPM and Durrell Listening-Reading Series were administered by the classroom teachers; the AMP and word recognition tests by the principal investigator of this study.

Pearson product moment correlation coefficients were calculated among the raw scores for each variable. "Student's *t*-tests" were then carried out to determine the statistical significance of the correlation coefficients and the differences between them.

Results

Table 1 shows the means and standard deviations of the nine tests included in this study.

Table 2 shows the intercorrelation coefficients among those nine tests and, where pertinent, their levels of statistical significance.

Table 1

Means and Standard Deviations for Nine Tests

Test	Maximum Score	*M*	*SD*
CPM	36	26.12	7.02
AMP	33	26.6	2.61
Listening Comprehension			
Vocabulary	96	84.84	7.86
Sentence	40	37.12	2.63
Total	136	121.96	9.70
Reading Comprehension			
Vocabulary	96	59.92	16.25
Sentence	40	24.12	7.91
Total	136	84.04	22.85
Word Recognition	90	56.88	21.57

Table 2
Correlation Matrix

Test[a]	1	2	3	4	5	6	7	8	9
1	1.00	.37	.70**	.65**	.74**	.21	.19	.21	-.16
2		1.00	.14	.17	.16	.45*	.38*	.45*	.37*
3			1.00	.61	.98	.11	.19	.15	-.16
4				1.00	.77	-.08	.04	-.04	-.33
5					1.00	.07	.17	.11	-.22
6						1.00	.76	.97	.80**
7							1.00	.89	.71**
8								1.00	.82**
9									1.00

[a]Number of test:

1. CPM
2. AMP

Listening Comprehension:

3. Vocabulary
4. Sentence
5. Total

Reading Comprehension

6. Vocabulary
7. Sentence
8. Total
9. Word Recognition

*$p < .05$.
**$p < .001$.

Noteworthy in Table 2 are the strong positive relationships between the CPM and the listening comprehension tests, r = .70, .65, .74, as compared to the weaker relationships between the CPM and the reading comprehension tests, r = .21, .19, .21.

In contrast, very weak relationships were found between the AMP and the listening comprehension tests, r = .14, .17, .16, as compared to the relationships between the AMP and the reading comprehension tests, r = .45, .38, .45.

The correlations between the word recognition and the listening comprehension tests were weak and negative, r = -.16, -.33, -.22, while the correlations between word recognition and reading comprehension were all positive and highly significant, r = .80, .71, .82. The relationship between the word recognition test and the AMP was significant, r = .37; that between the word recognition test and the CPM was not, r = -.16.

Table 3 shows the significance of the differences between the correlations of the CPM and the AMP with listening and reading comprehension. It also presents the differences between the correlations for listening comprehension and reading comprehension as predicted by either the CPM or the AMP.

Table 3
Differences Between Correlations For the CPM and AMP
As Predictors of Listening and Reading Comprehension

Predictor Variables		Criterion Variables			
		Listening Comprehension	Reading Comprehension		
		Total	Total	t(22)	p
CPM		.74	.21	2.83	< .01
AMP		.16	.45	1.15	*ns*
	t(22)	5.18	1.12		
	p	< .001	*ns*		

The difference between the CPM and AMP as predictors of listening comprehension was highly significant, $t\,(22) = 5.18$, $p < .001$; the CPM was the better predictor. In contrast, the AMP was a better predictor of reading comprehension than the CPM, but this difference was not statistically significant, $t(22) = 1.12$.

Looking at the data another way, Table 3 shows that the CPM predicted listening comprehension significantly better than it predicted reading comprehension, $t(22) = 2.83$, $p < .01$. The AMP, on the other hand, predicted reading comprehension better than it predicted listening comprehension, but this difference was not significant, $t(22) = 1.15$.

The significance of the difference between listening comprehension and reading comprehension as moderated by word recognition is noteworthy. Word recognition test scores were much more closely related to the reading comprehension scores, $r = .82$, than to listening comprehension scores, $r = -.22$, and this difference is highly significant, $t(22) = 7.62$, $p < .001$. In fact, it appears that word recognition, for this sample of students, explained more of the variance in reading comprehension scores than either the CPM or the AMP (see Table 3).

In summary, visual perceptual skills predicted listening comprehension significantly better than reading comprehension, while auditory perceptual skills predicted reading comprehension better than listening comprehension. The relationship between word recognition and reading comprehension was strong and positive, whereas that between word recognition and listening comprehension was inconsequential. Finally, word recognition, compared to the CPM and AMP, explained the greatest percentage of variance in reading comprehension scores.

Discussion

The data from this sample clearly show a close interrelationship between certain visual perceptual skills and listening comprehension. An explanation for the difference in correlations between visual perceptual skills and listening comprehension, and visual perceptual skills and reading comprehension, may be found by examining the decoding skills of these particular students. Recall that the children in this study had poor decoding skills. For such students, their response to a reading comprehension test must also reflect their decoding difficulties. On the other hand, a measure of listening comprehension does not reflect poor decoding skills. (It may, however, reflect poor listening skills.) Thus, a test of listening comprehension may be considered a measure of comprehension that is independent of decoding ability.

If the above is accurate, one might speculate that visual perceptual skills would predict both listening and reading comprehension equally well for students who have good decoding skills. An additional analysis of the data was carried out to explore this speculation.

A partial correlation coefficient was calculated between visual perceptual skills and reading comprehension, holding word recognition (decoding) skills constant. By partialing out the variance explained by decoding skills, the correlation coefficient increased from .45 to .66. Thus, the total explained variance between visual perceptual skills and listening comprehension is increased by approximately 12%.

The relationships between auditory perceptual skills and listening and reading comprehension were approximately the inverse of those between visual perceptual skills and listening and reading comprehension. That is, auditory perceptual skills predicted reading comprehension, which involves decoding, better than they predicted listening comprehension. This difference in correlations was expected since it has been shown that auditory

perceptual skills are closely related to early reading achievement (Rosner, 1974), which in turn is related to decoding.

One might question why the auditory perceptual test was not a good predictor of listening comprehension in this study. The AMP test requires listening, but does not measure listening skills. It measures phonemic analysis skills, that is, the extent to which one can analyze spoken words into their separate sounds. Thus, the AMP measures something different from listening and would not be expected to predict comprehension of spoken messages.

The word recognition test was included to explore the relationship between decoding skills and reading comprehension. Word recognition was closely related to reading comprehension, but not to listening comprehension; it explained approximately 67% of the variance in reading comprehension and only 5% of the variance in listening comprehension. The magnitude of the relationship between word recognition and reading comprehension supports the notion that for poor decoders, it may be impossible to measure the comprehension of written material.

Many children demonstrate poor reading comprehension. Poor decoding does not adequately explain the problems of these poor comprehenders. There is now evidence to suggest that visual perceptual skills are closely related to these problems and may account for variance unexplained by poor decoding skills. Further investigation with different samples is needed.

Reference Notes

1. Goodman, K. S. Is the linguistic approach an improvement in reading instruction? Paper presented at the annual meeting of the International Reading Association, Boston, May 1968.

References

Carroll, J. B. The analysis of reading instruction: Perspectives from psychology and linguistics. Sixty-third Yearbook of the National Society for the Study of Education (Part 1), 1964, 63, 336-353.

Chall, J. Learning to read: The great debate. New York: McGraw Hill, 1967.

Cromer, W. The difference model: A new explanation for some reading difficulties. Journal of Educational Psychology, 1970, 61, 471-483.

Durrell, D. D., & Hayes, M. T. Durrell Listening-Reading Series, Primary Level. New York: Harcourt Brace Jovanovich, 1970.

Fries, C. C. Linguistics and reading. New York: Holt, Rinehart, and Winston, 1962.

Hackett, M. G. A hierarchy of skills in listening comprehension and reading comprehension. Unpublished doctoral dissertation, University of California, 1968.

Raven, J. Coloured Progressive Matrices. New York: The Psychological Corporation, 1965.

Rosner, J. The development and validation of an individualized perceptual skills curriculum. Pittsburgh: University of Pittsburgh, Learning Research and Development Center, 1972. (Publication No. 1972/7).

Rosner, J. Perceptual Skills Curriculum. New York: Walker Educational Book Corp., 1973.

Rosner, J. Auditory analysis training with prereaders. The Reading Teacher, 1974, 27, 379-384.

Rosner, J. Helping children overcome learning difficulties. New York: Walker Publishing Co., 1975.

Ruddell, R. R. Oral language and development of other language skills. Elementary English, 1966, 43, 489-498.

Slaughter, B. An examination of the relationship between a three-stage process model of reading and visual and auditory perceptual skills. Unpublished master's thesis, University of Pittsburgh, 1974.

Spache, G. Diagnostic Reading Scales. Monterey, Calif.: McGraw Hill, 1963.

Tuckman, B. W. Conducting educational research. New York: Harcourt Brace Jovanovich, 1972.

Wiener, M. B., & Cromer, W. Reading and reading difficulty: A conceptual analysis. Harvard Educational Review, 1967, 37, 620-643.